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BIOLOGICAL EVALUATION OF THE LAGUNA MOUNTAIN ENTRANCE SITE, CLEVELAND NATIONAL FOREST

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INTRODUCTION

Laguna Mountain Recreation Area, a part of the Descanso Ranger District (Cleveland National Forest), is a wooded plateau at 5200-6400 ft. elevation east of San Diego, California. As the forested area most accessible to the inhabitants of San Diego and surrounding communities, it receives as many as 1.5 million visitor-days of use per year. Six campgrounds, two picnic areas, 169 summer homes and two organization camps located on land administered by the Forest Service provide for the public's needs.

VEGETATION

Laguna Mountain contains about 7100 acres of timber in the yellow pine type, mostly Jeffrey pine (Pinus jeffreyi), Coulter pine (P. coulteri) and California black oak (Quercus kelloggii), with a minor component of canyon live oak (Q. chrysolepis) and incense-cedar (Calocedrus decurrens). Coast live oak (Q. agrifolia) can be found around the fringes of the plateau, and Perry pinyon pine (P. quadrifolia) occurs on the eastern, abrupt edge of the plateau.

INSECTS AND DISEASES

Forest pests of Laguna Mountain have received considerable attention over the years. Prior to about 1975, direct insect suppression measures aimed at reducing tree mortality caused by western pine beetle (Dendroctonus brevicomis) and California flatheaded borer (Melanophila californica) had been carried out for about fifty years. Surveys to locate western dwarf mistletoe (Arceuthobium campylopodum) show that this parasite is present on much of the forested area of the mountain, and is extremely heavy in localized areas. Annosus root rot caused by Fomes annosus has been observed here since the early 1940's. In spite of these past suppression efforts, significant mortality continues to occur on Laguna Mountain. Since increases in recreation use are often accompanied by further deterioration of sensitive stands, continued or increased levels of mortality are to be expected.

The overall mortality rate on Laguna Mountain is much higher than that occurring in other parts of California, exclusive of drought years. A survey conducted on the San Bernardino National Forest in 1976-1978 indicated mortality rates far lower than those found on Laguna Mountain.

In 1979, the Forest Service decided to invest $8-9 million over the next 22 years to develop additional recreation facilities on Laguna Mountain. Because of the significant insect and disease problems in the area, a biological evaluation was requested and is being conducted on each recreation site where development is proposed, to determine what impact insects and diseases will have on the site, how to manage the vegetation on the site to enhance the recreation experience without creating greater insect and disease problems, and how to best maintain adequate forest cover on the site over a long period of time where insects and disease are now present. This report deals with just the Laguna Meadow Arrival Complex.

TECHNICAL INFORMATION

The Laguna Meadow arrival complex site is a forested area of predominantly Jeffrey

pine with scattered incense-cedar and California black oaks. The upper areas-i.e.: Parking lot #2 and the Vista Ridge Passive Appreciation area-are large meadows bordered by Jeffrey pine and scattered large oaks.

The insects and diseases found on this site are California flatheaded borer, annosus root rot and western dwarf mistletoe.

California flatheaded borer (Melanophila californica):
The hosts of the California flatheaded borer are Jeffrey and Coulter pine. It is most severe in stands located on sites where environmental stress is common. Decadent or unhealthy trees are most frequently attacked and occasionally the tops of thrifty, vigorous trees are attacked.

Newly-hatched larvae penetrate directly through the bark to the phloem. Here the larvae may feed from a few months to 4 years without any apparent effect on the host tree. Should host vigor and larval abundance not allow them to succeed, the larvae cut very short galleries before they are killed. Their galleries do not seriously injure the tree and are overgrown by the cambium. Trees weakened by the insect are more susceptible to attack by engraver beetles. Should conditions be, or become, favorable for the larvae and unfavorable for the tree, the larvae develop rapidly and destroy the cambium. In general, this insect kills trees weakened by dwarf mistletoe, root disease, and/or stresses that include drought, overstocking, tree injury, soil compaction, and old age.

Annosus Root Disease (Fomes annosus):
F. annosus is a higher fungus which kills and decays the roots of many coniferous forest trees. All western conifers are susceptible to attack by this fungus.

This fungus colonizes newly cut pine stumps and their roots and from there moves via root contacts into the root systems of adjacent live trees. It moves through the roots of these live trees to the root crown where it girdles and kills the host tree. Enlarging centers of F. annosus-killed trees are formed as this fungus travels from tree to tree through their root systems. The fungus may remain viable in the old stumps and roots of infected trees, for over 50 years in east-side pine; and all newly established pines whose roots contact these old stumps may be killed. Thus, these areas may be nonproductive for over 50 years and the losses associated with F. annosus include not only the original mortality but also any new vegetation growth which would have become established in area encompassed by the center.

Western Dwarf Mistletoe (Arceuthobium campylopodum):
Western dwarf mistletoe infects Jeffrey, ponderosa and Coulter pines. Other conifers are rarely infected and hardwoods are immune. The pathogen is an obligate parasite that can only exist on a live host. It obtains all its nutrients, minerals and water from the host tree.

This parasite is a dioecious, perennial higher plant that produces seeds which are its means of spread. In the fall of the year when the fruit falls from the stem, the seed is ejected upward and outward. The seed (covered with viscin, a sticky, gelatinous substance), adheres to what ever it contacts. When the seed lands in the crown of a tree, it will adhere to the needles or limb, where it will overwinter. The following spring it will germinate and penetrate into the limb. For the next 2 to 4 years it will grow within the tree, developing a root-like endophytic system in the inner bark and outer sapwood. It will then produce aerial shoots and in

another 2-4 years it will produce viable fruit.

Spread of dwarf mistletoe is limited to the distance traveled by the seed, which from overstory to understory is usually 20-60 feet, but which may be as much as 100 feet if wind assists the seeds. A rule of thumb is that dwarf mistletoe can spread a distance equal to the height of the plants in the infected trees. Because of the various limits to spread, the actual spread rate through a stand is 1-2 feet per year.

MANAGEMENT STRATEGIES

California flatheaded borer:
California flatheaded borer is most commonly a problem where trees are under stress, unhealthy or decadent. The key to reducing the impact of this insect is to maintain a healthy, vigorous stand by: 1) regulating vegetative competition through stand manipulation to achieve optimum stand density and controlling shrubs and grasses, and 2) reducing the impact of dwarf mistletoe and regenerating Fomes annosus infection centers with trees that are resistant to the disease.

Also, in areas where there is going to be new construction, special efforts should be made to prevent damage to the selected leave trees, especially in the root system.

Annosus Root Decay: Annosus root rot is seldom controlled in the usual sense of the word; instead, new infection centers are prevented through the use of a chemical, and stands are managed so as to minimize the effects of the fungus when present. Control practices and other measures designed to prevent hazards and reduce the impact of this disease are:

Prevention of stump infection.
Granular borax, sodium tetraborate decahydrate, is registered for application to freshly cut stumps. It is effective in preventing most new infections, and its application is required on all stumps cut in and near developed recreation sites (FSM R-5 Supp. 2305.33). All of Laguna Mountain has been determined to be in or near developed recreation areas.

Type conversion. Conifers planted in and around infection centers will eventually become infected and die, leaving the center unstocked. All conifers are susceptible to one degree or another, but hardwoods are rarely infected. Accordingly, hardwoods should be favored, planted, or otherwise regenerated in and around infection centers. If hardwoods are planted around infection centers they may interrupt the continuous root contacts between conifers and slow down or stop the spread of the disease. The fungus will eventually die out in the centers so that conifers can be regenerated, but this will probably take 50 years or more.

Location of facilities. Buildings, campgrounds, picnic areas, and other facilities should not be located near infection centers. Unfortunately, most potential sites on the Mountain are located near a center.

As an alternative, before locating important new developments, especially buildings, the Fomes annosus Location Map and the 1:10,000 scale photos should be consulted. When the root disease is indicated to be near proposed developments, an on-site inspection should be made, preferably by a plant pathologist from FIDM, to advise

on the root disease situation at the exact alternative locations for recreation developments. It is suggested that buildings not be located near the margins of centers containing large trees which will eventually die and may fall on these structures. On the other hand, they can be located well inside centers where the danger of being hit by trees is minimal, and which will be regenerated after construction. In much the same way, roads and asphalt pads in campgrounds and parking lots can often be located in infection centers in order to take advantage of clearings which would otherwise have to be regenerated. Construction often causes additional infections due to tree scarring and root damage, and locating developments in existing centers will decrease the damage to the surrounding stand.

Removal of infected trees. Pines infected by annosus root rot usually are killed by bark beetles or borers, but sometimes an infected pine sustains extensive root decay and windthrows while still alive, causing property damage, personal injury or death. This type of tree failure occurs more frequently in incense-cedar than pine. It is recommended that a pathologist examine all centers near development before construction begins so that all trees expressing root disease symptoms or other hazards can be identified for management.

In addition, periodic inspections should be made after construction in order to identify additonal hazardous trees. This inspection can be made by a FIDM pathologist or by a person assigned to the Forest and trained by FIDM.

Early, heavy thinning of young pine stands is recommended because it limits the number of successful stump infections and subsequent root disease centers. Small stumps dry out quickly and the opening of the canopy allows the sun to heat them to high temperatures lethal to the fungus.

Western Dwarf Mistletoe:
In developing stand management prescriptions for ponderosa, Jeffrey and Coulter pine stands infected with dwarf mistletoe, the following stand treatments or combinations of stand treatments may be used to control or lessen the impact of this pest on forest recreation stands. These suggested treatments are arranged by age classes of the recreation stands.

A. Even-aged (single-storied) stands above 6" dbh

1. Thin mistletoe-infected stands to maintain optimum growth of the residuals and reduce stress. Select against mistletoe-infected trees. Consider the removal of all trees with Hawksworth dwarf mistletoe rating of 5 and 6. Such trees will probably die within the next 10-year period, most likely during the next drought. Treat all freshly-cut stumps with borax to prevent invasion by Fomes annosus.

2. Broom prune high-value dwarf mistletoe-infected trees, if after removal of the dwarf mistletoe brooms, the trees will have a live crown ratio of 30% or more.

3. When treating stands, the creation of buffer strips should be considered at the margins of dwarf mistletoe infestations to prevent spread into or out of the treated area. These buffers should be used in the following

order of priority.

a. Natural occurring buffers (meadows, roads and changes in type).

b. Type conversion, by removal of susceptible species.

c. Clear cut strips.

d. Periodic (2-year) pruning of strips of lightly to moderately infected pines.

4. Pruning of all infected branches in infected trees in an attempt to eradicate this pest is generally not recommended. But in exceptional cases, where attempted on high-value trees, this treatment should be restricted to trees with a dwarf mistletoe rating of 1 or 2 which have infections restricted to the lower 1/3 of the crown. When pruning, remove all branches in the lower ½ of the crown. Again, do not attempt if this will result in a tree with a crown of less than 30% or if the tree will be exposed to continued infection from adjacent infected trees. (Schedule 6 years of resurvey/retreatment at 2-year intervals).

5. Eradication of small infestations of dwarf mistletoe patches in pole or mature timber by cutting all infected trees should be attempted only in areas of about 1 acre or less and should be inspected and retreated every 2 years for a 6-year period.

B. Even-aged stands under 6" dbh

1. Residual removal. Where infected overstory residuals threaten young developing stands, remove the infected residual trees and treat the young stands by thinning or pruning mistletoe out of infested understory stands. Plan for resurvey and retreatment of the young stand every 2 yearsfor a 6-year period.

2. Stand destruction. Young stands (seedling-sapling) moderately to heavily infected should be destroyed along with infested overstory trees within and at margins of the treated stand. Regenerate, resurvey, and retreat any new-appearing infections along margins of treated area.

C. All-aged or multistoried stands

1. If regeneration of the stand is desired, the following steps should be taken in order:

a. Remove overstory.

b. Remove all infected trees from released understory.

c. Create a buffer strip around released stand, if needed.

d. Run post-treatment surveys every 2 years for 6 years.

2. If it is desirable to retain the overstory:

   a. Remove infected understory in competition with overstory.

   b. Broom prune highly valuable overstory trees.

   c. Replant openings in infected stands as they develop, with resistant species (oaks, cedars, firs, sugar pine).

PEST PROBLEMS AT SPECIFIC PLACES IN THE ARRIVAL COMPLEX

The area south of the existing Kemp Ranch house and east of Parking Lot #1 (refer to the map) contains many active Fomes annosus infection centers. These infection centers are slowly spreading and as a result eliminating conifers as viable species options for vegetative management on this site. If it is desirable to maintain tree cover on this site, hardwood species should be favored and, where necessary, planted. Conifer species should be discriminated against for at least 50 years.

In the Vista Ridge Passive Appreciation Area and Parking Lot #2 the objective is to maintain the vegetative cover as it now exists while still offering a safe area for picnicking and parking. The major problem will be the Forest's ability to maintain and protect the large oaks in this area. Very little knowledge is available on this subject, and obtaining outside expertise from a reliable tree service organization would be warranted. There is some information on the regeneration and maintenance of oaks enclosed with this report, but it is limited. For example, it lacks information on identification and evaluation of decays associated with hazard.

Dwarf mistletoe is scattered throughout the area where the Arrival Complex is being established. It is limited in the Kemp Ranch area, but on top of the ridge and in the area around Parking Lot #2 it is both extensive and intensive. On top of the ridge along the fence the dwarf mistletoe is very heavy. There, no development is planned. However, if it is to provide part of the overall visitor experience, the vegetation in the area will have to be managed, and a major part of the management will need to include reducing the impact from dwarf mistletoe. There is also a dwarf mistletoe problem in the proposed Parking Lot #2 area. This is to be a developed site; therefore, the landscrape architect and a pathologist from FIDM should discuss the possible control options while on the site, to help achieve the architect's objectives.

There is a Fomes annosus infection center in the proposed area for Parking Lot #3. The borders of this infection center should be determined and the parking area installed, if possible, to include the infection center plus a 50-foot buffer. This will reduce the possibility of a tree failure in the parking lot area. If this is not possible, all conifers within the infection center should be removed and a buffer of native hardwoods established between the existing conifer stand and the infection center.

If there are any questions concerning this biological evaluation, contact Dick Smith, Pathology Group Leader of the FIDM Staff, (415) 556-6891.